

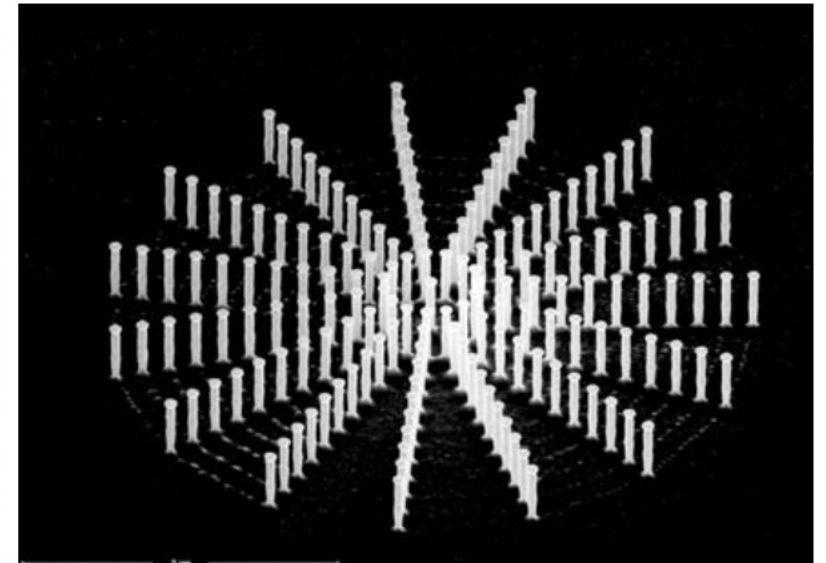
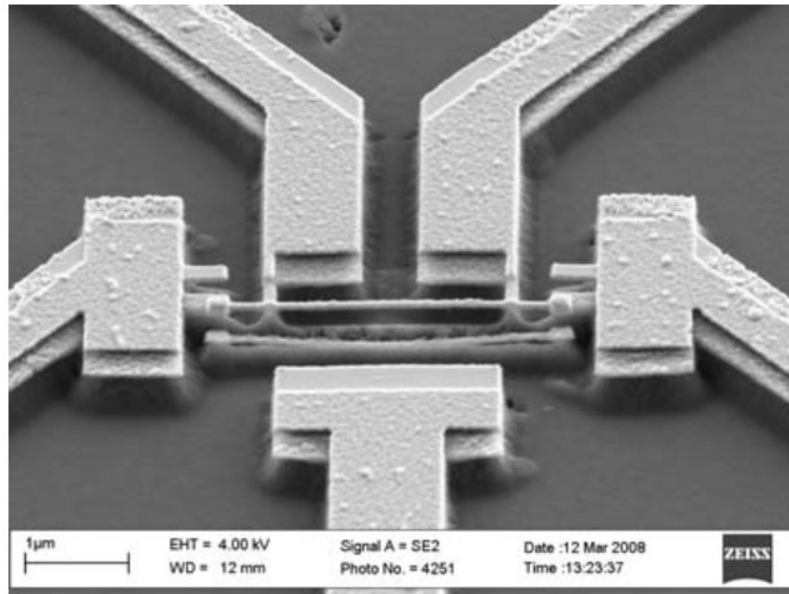
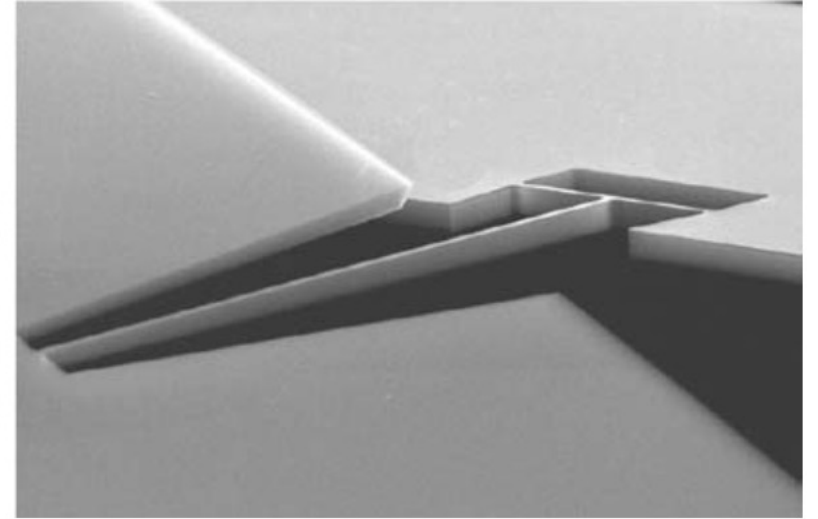
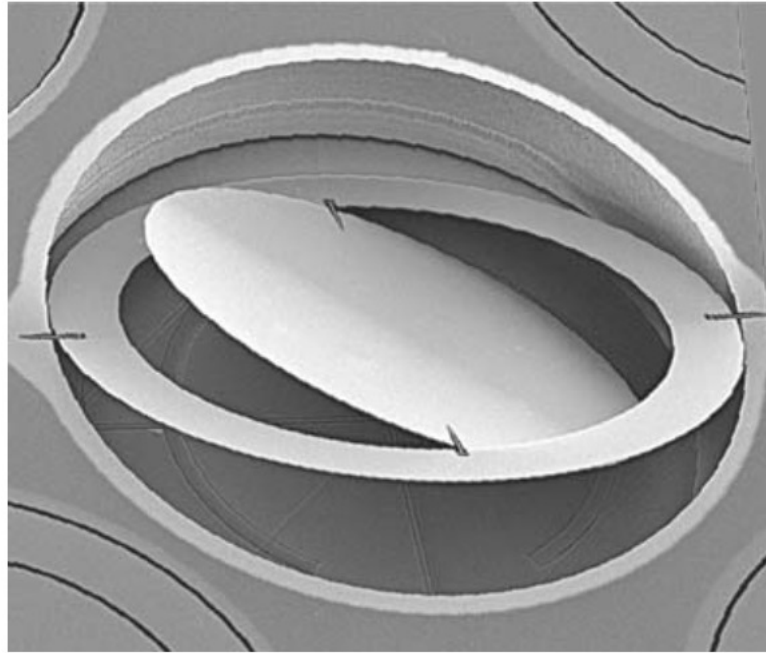
Welcome to

MLL 7401

Micro and Nanofabrication Techniques

2025-2026 Even Semester

3 – 0 – 0



Team

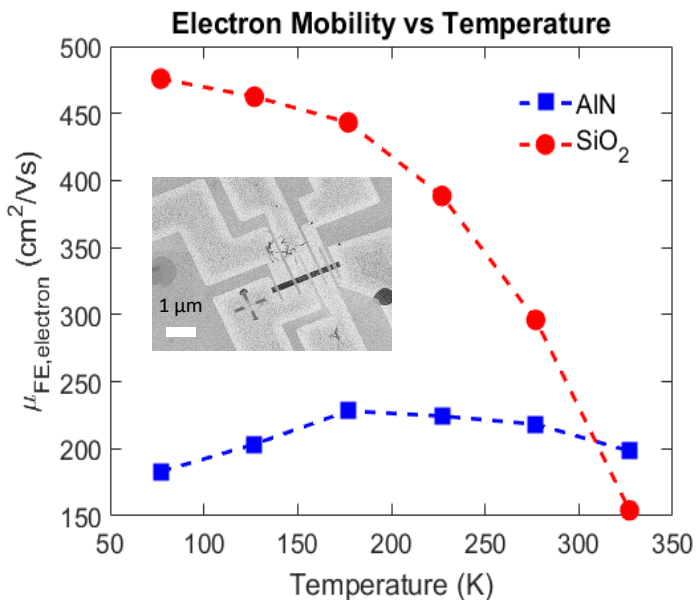
Krishna Balasubramanian

- Assistant Professor, Department of Material Science and Engineering
- Webpage:
<https://web.iitd.ac.in/~bkrishna>
- Email: bkrishna@mse.iitd.ac.in
- Ph: 01126548559

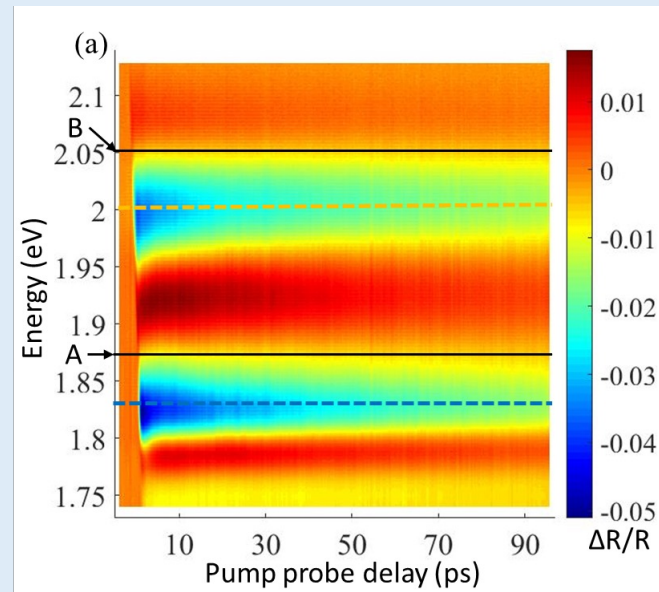
Teaching Assistants:

Apurva Yadav (msz248341@iitd.ac.in)

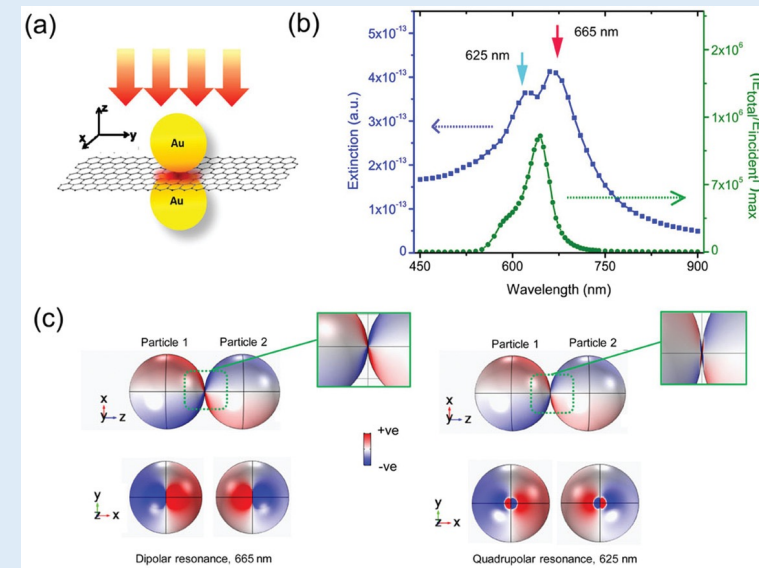
Graphene on III-V substrates



Ultra-fast dark exciton dynamics – TMD MoS₂

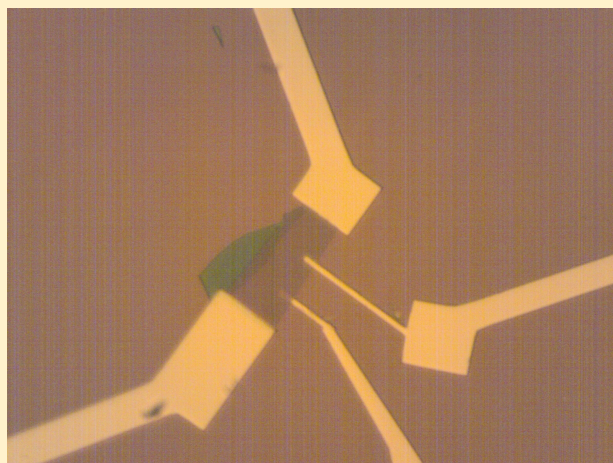


2D-nanoparticle plasmonics

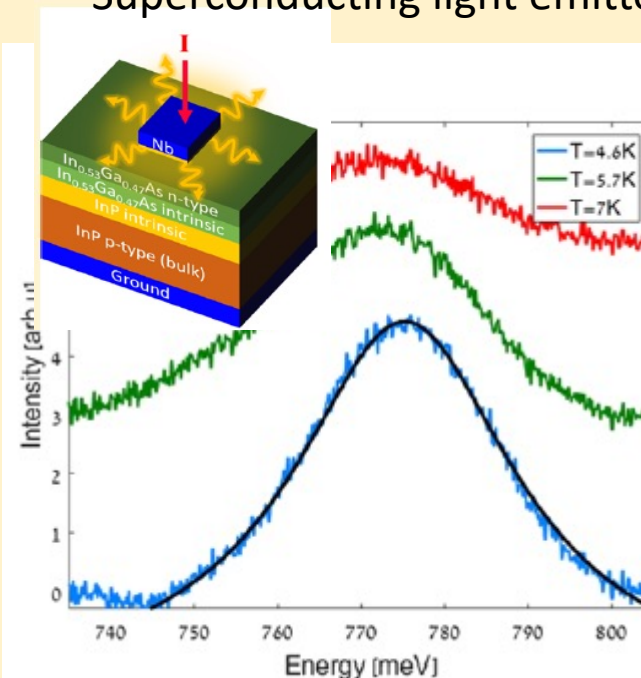


2D Electron transport
and optics

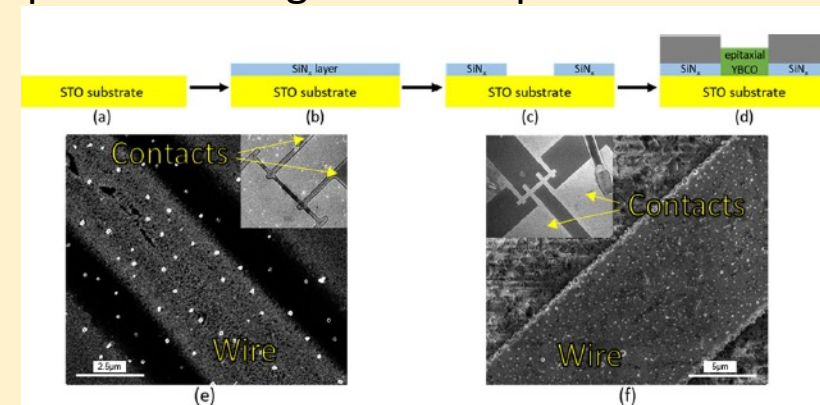
2D – Superconductor interfaces



Superconducting light emitters



Superconducting nanowire photon detector



Superconductivity

Nature communications 10 (1), 1-9
Optics Express 27 (23), 33427-33435
physica status solidi (a) 217 (16), 1900949
Journal of Physics D: Applied Physics 49 (26), 265301
Nanotechnology 27 (20)

About the course

- First Step into Electrical/Electronic Materials
- We will deal with
 - Electronic properties
 - Dielectric properties
 - Optical properties
 - Magnetic properties

Content

- 1. Introduction to Micro and Nanofabrication - the need and scope
- 2. Micro-metrology and characterisation
- 3. Substrate bulk growth, and thin-film processes
- 4. Oxidation, diffusion and ion implantations
- 5. Pattern generation (a) Lithography
 - (b) Etching
- 6. Polymer processing
- 7. Glass processing and Bonding
- 8. MEMS/NEMS process Integration
- 9. Yield and reliability.
- 10. Recent trends in cleanroom technology, ultra scaling and Beyond-Moore

Course Information

Course Timing:

- Lectures
Monday and Thursday 5:00 PM – 6:30 PM

Prerequisites:

- Introduction to Electronic Materials
- Materials Characterization Techniques
- MLL100 Equivalent

Lecture Hosting

- Lecture delivery:
 - All sessions in-person at LH623
 - Attendance will be recorded. In-fact participation in lectures is mandatory.
- Homework to be submitted in moodle. Could involve simple coding exercising.
 - Submissions are binary: either you submit before time or leave without marks.
Sorry, no concessions for any amount of delay!
- All exams and evaluation will be offline. The answer sheets will be evaluated by TA assigned.
- Dishonesty will be very seriously dealt with. We are a huge team of very experienced professionals. So, any malpractice will be identified, and the student will be given a 'F'. Remember, this is much worse than just dropping the course!

References

Multiple references for each topic. Will be announced during the lecture time. General references are as follows:

- Madou, Marc. *Fundamentals of Microfabrication: The Science of Miniaturization*. 2nd ed. Boca Raton, FL: CRC Press, 2002. ISBN: 9780849308260.
- Campbell, Stephen. *The Science and Engineering of Microelectronic Fabrication*. 2nd ed. New York, NY: Oxford University Press, 2001. ISBN: 9780195136050.
- Plummer, James, Michael Deal, and Peter Griffin. *Silicon VLSI Technology: Fundamentals, Practice, and Modeling*. Upper Saddle River, NJ: Prentice Hall, 2000. ISBN: 9780130850379.

Evaluation policy

Evaluation:

- Relatively graded course with the following split up:

Lecture part:

- **35% minor, 45 % major, 10% homework/assignments/quizzes and 10 % in-class interactions**
- **Audit Pass is 35%**

Academic Honesty

All students registering to this course voluntarily commit to the academic integrity, research and Ethics policy, IIT Delhi (https://academics.iitd.ac.in/sites/default/files/registration/forms/10_FORM%20H.pdf). This is an under-graduate level course in the country's most premier institute, and I expect the students to know their responsibility. If any document submitted to us is plagiarized (copied verbatim either from textbook/ online resources/ fellow students...), the student will be deregistered and promptly handed to institute authorities.

Discussion is okay for homework, but the submission needs to reflect the student's work. No discussion/references are allowed in lab sheets, quizzes/minors/final exams.